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(19)

(54) AN AIRCRAFT FUSELAGE-MOUNTED UNDERCARRIAGE

(71) We, MESSIER-HISPANO, a body corporate organised and existing under the laws of France, of 15 Avenue d'Eylau, 75116 Paris, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to an aircraft fuselage-mounted undercarriage with means for laterally raising and retracting a wheel below the floor of the aircraft.

In the case of high wing aircraft, fuselage-mounted undercarriages are often preferable to wing-mounted undercarriages.

According to the invention there is provided an aircraft fuselage-mounted undercarriage having a trailing wheel, being laterally retractable, and comprising a triangulated structure comprising a rod with a longitudinal axis parallel to the axis of symmetry of the aircraft, a rigid structural leg at the front end of the rod and perpendicular thereto, and an oblique lever connected between the rear of the rigid structural leg and the rear end of the rod; the said triangulated structure pivoting on the aircraft about the longitudinal axis of the rod by means of a front horizontal pivot on the front of the rigid structural leg and a rear horizontal pivot at the rear end of the oblique lever and on the longitudinal axis of the rod; the undercarriage further comprising means pivoting it both for lowering and retracting, locking means and suspension means to control movement of the wheel relative to the rigid structural leg and being so dimensioned that a plane normal to the longitudinal axis of the rod and passing through the front end of the front horizontal pivot of said triangulated structure passes in front of a tyre of the wheel and a plane normal to the longitudinal axis of the rod and passing through the rear end of the rear horizontal pivot of said triangulated structure passes behind the tyre of the wheel when the suspension means is not loaded.

In such an undercarriage, upon retraction the wheel is housed below the floor of the aircraft with its axle substantially vertical.

Preferably the front end of the rod is connected to the rigid structural leg by a spindle extending perpendicular to the rod; the rear end of the rod is connected to the oblique lever by a pin extending perpendicular to the axis of the rod; and the oblique lever carries the rear horizontal pivot at its rear end and at its front end is forked and connected to the rear of the rigid structural leg by a pin extending perpendicular to the axis of the rigid structural leg.

Advantageously the locking means comprise a strut which moves in a plane normal to the axis of the rod and located between the rigid structural leg and a part of the aircraft which mounts a bearing for the front horizontal pivot of the rod.

The suspension means preferably comprises a trailing arm lever which carries the axle of the wheel and is connected by a pin to the rigid structural leg and by another pin to a shock absorber, the shock absorber being connected by a pin to a bracket carried by said spindle and the shock absorber passing between fork arms of the forked oblique lever. The bracket is offset with respect to the longitudinal axis of the spindle in such a way that with the spindle in a determined angular position the wheel is mounted in a low position and with the spindle rotated half a turn about its longitudinal axis from said determined angular position, the wheel is mounted in a high position.

The undercarriage may be mounted in tandem with a further undercarriage, the undercarriage being mounted on the aircraft in a manner such that a portion of a frame of the aircraft provides support for both the rear horizontal pivot of the front one of the undercarriages and the front horizontal pivot of the rear one of the undercarriages. Preferably the spindles are so disposed that the wheel of the front undercarriage is in the low position and the wheel of the rear under-

carriage is in the high position.

The invention is diagrammatically illustrated by way of example in the accompanying drawings, in which:—

Figure 1 is a side elevation of lefthand aircraft fuselage-mounted undercarriages according to the invention in the lowered position, the tyres being shown in both the lowered and retracted positions in dotted lines; and

Figure 2 is a front elevation of the undercarriages of Figure 1 in the lowered position and also showing the retracted position in dotted lines. Righthand undercarriages of the aircraft are similar but oppositely handed to the lefthand undercarriages illustrated.

Referring to the drawings, two lefthand undercarriages arranged in tandem are made up from identical components, and generally only the front undercarriage is referenced; the lower position of the wheel of the front undercarriage relative to the wheel of the rear undercarriage is obtained by positioning an upper mounting bracket for a shock absorber differently.

An axle 1 carrying a wheel 2 is mounted on a trailing arm lever 3 which is pivotally connected at 4 to a rigid structural leg 5. A mid-part of the arm 3 is coupled by a pin 6 to a shock absorber 7.

The longitudinal axis of the structural leg 5 is vertical when viewed in side elevation as in Figure 1. A rear part of the structural leg 5 is coupled by a pin 8 to the front end of an oblique lever 9 and an upper rear part of the structural leg 5 is coupled by a spindle 10, Figure 2, to the front end of a rod 11 with the rod 11 extending perpendicular to the leg 5. The outer end of the spindle 10 has a bracket 12 mounted thereon in an offset position with respect to the longitudinal axis of the spindle 10, the upper end of the shock absorber 7 being pivotally mounted in the bracket 12 by means of a pin 13. The front part of the structural leg 5 has a pivot 14 for connection to a bracing strut 15 and a horizontal front pivot 16 for connection to the frame of the aircraft.

The rear part of the oblique lever 9 has a horizontal rear pivot 17, for connection to the frame of the aircraft and also a bracket portion whereby it is linked by a pin 18 with the rear end of the rod 11, the relative disposition being such that the longitudinal axis of the oblique lever 9 intersects the longitudinal axis X of the rod 11 at 17. The longitudinal axis X of the rod 11 is aligned with the pivot axis of the horizontal front pivot 16 and the horizontal rear pivot 17. The front part of the lever 9 is forked at 19, through which fork the shock absorber 7 passes, each arm of the fork 19 being connected to the structural leg 5 by the pin 8.

The bracing strut 15 illustrated is of the known double acting kind but could be of other known kind if desired. It is connected to the aircraft at 20 and moves in a vertical plane perpendicular to the axis X and located in front of the structural leg 5.

A raising and lowering ram 21 is connected to the aircraft at 20 and to the structural leg 5 at 22.

On the rear undercarriage the bracket 12' mounting the upper end of the shock absorber 7' is in a high position, whereas the bracket 12 of the front undercarriage is in a low position, obtained by rotating the spindle 10 through half a turn from the position of the spindle mounting the bracket 12', so that the wheel 2' of the rear undercarriage is higher in the lowered position than the wheel 2 of the front undercarriage.

Apart from the fact that the structural legs 5 of the front and rear undercarriages are independent, which increases the reliability of the whole unit, the undercarriage arrangement described above can have the following advantages:

Since each structural leg 5, when lowered is vertical when viewed in side elevation, the strut 15 located in front of the leg 5 can move freely in a plane perpendicular to the longitudinal axis of the aircraft, in a space between a frame member limiting the front of the undercarriage bay and the structural leg 5.

The rear horizontal pivot 17 connecting the front undercarriage to the aircraft is located on a frame member which limits the rear of the front undercarriage bay, this frame member being at a tangent to the tyre.

Since for each undercarriage the rear horizontal pivot 17 is connected to the structural leg 5 by the triangulated structure made up of the oblique lever 9, the rod 11, and the leg 5 the undercarriage can have good rigidity for low weight.

As the shock absorber 7 passes through the fork 19 of the oblique lever 9, the undercarriage can have a small dimension when viewed in front elevation, which makes it easy to house it below the floor of the aircraft. The shock absorber 7 can be easily dismantled, with the aircraft supported on uprights, after removal of the pins 6 and 13.

Where, as described above, two undercarriages are provided in tandem, an intermediate frame member which support the rear horizontal pivot of the front undercarriage and the front horizontal pivot of the rear undercarriage has vertical loads applied to it caused by longitudinal loads applied to the wheel of the front undercarriage and oppositely directed vertical loads applied to it by the longitudinal loads applied to the wheel of the rear undercarriage, such vertical loads and oppositely directed

vertical loads at least partially cancelling each other out.

WHAT WE CLAIM IS:—

1. An aircraft fuselage-mounted undercarriage having a trailing wheel, being laterally retractable, and comprising a triangulated structure comprising a rod with a longitudinal axis parallel to the axis of symmetry of the aircraft, a rigid structural leg at the front end of the rod and perpendicular thereto, and an oblique lever connected between the rear of the rigid structural leg and the rear end of the rod; the said triangulated structure pivoting on the aircraft about the longitudinal axis of the rod by means of a front horizontal pivot on the front of the rigid structural leg and a rear horizontal pivot at the rear end of the oblique lever and on the longitudinal axis of the rod; the undercarriage further comprising means pivoting it both for lowering and retracting, locking means and suspension means to control movement of the wheel relative to the rigid structural leg and being so dimensioned that a plane normal to the longitudinal axis of the rod and passing through the front end of the front horizontal pivot of said triangulated structure passes in front of a tyre of the wheel and a plane normal to the longitudinal axis of the rod and passing through the rear end of the rear horizontal pivot of said triangulated structure passes behind the tyre of the wheel when the suspension means is not loaded.

2. An aircraft fuselage-mounted undercarriage according to claim 1, in which the front end of the rod is connected to the rigid structural leg by a spindle extending perpendicular to the rod; the rear end of the rod is connected to the oblique lever by a pin extending perpendicular to the axis of the rod; and the oblique lever carries the rear horizontal pivot at its rear end and at its front end is forked and connected to the rear of the rigid structural leg by a pin extending perpendicular to the axis of the rigid structural leg.

3. An aircraft fuselage-mounted undercarriage according to claim 1 or claim 2, in which the locking means comprise a strut which moves in a plane normal to the axis of the rod and located between the rigid structural leg and a part of the aircraft which mounts a bearing for the front horizontal pivot of the rod.

4. An aircraft fuselage-mounted undercarriage according to claim 2, or claim 3 when appendant to claim 2, in which the suspension means comprises a trailing arm lever which carries the axle of the wheel and is connected by a pin to the rigid structural leg and by another pin to a shock absorber, the shock absorber being connected by a pin to a bracket carried by said spindle and the shock absorber passing between fork arms of the forked oblique lever.

5. An aircraft fuselage-mounted undercarriage according to claim 4, in which the bracket is offset with respect to the longitudinal axis of the spindle in such a way that with the spindle in a determined angular position the wheel is mounted in a low position and with the spindle rotated half a turn about its longitudinal axis from said determined angular position, the wheel is mounted in a high position.

6. An aircraft fuselage-mounted undercarriage according to any one of the preceding claims, mounted in tandem with further undercarriage, in which a portion of a frame of the aircraft provides support for both the rear horizontal pivot of the front one of the undercarriages and the front horizontal pivot of the rear one of the undercarriages.

7. An aircraft fuselage-mounted undercarriage according to claim 6 when appendant to claim 5, in which the spindles are so disposed that the wheel of the front undercarriage is in the low position and the wheel of the rear undercarriage is in the high position.

8. Aircraft fuselage-mounted undercarriages substantially as hereinbefore described and illustrated with reference to the accompanying drawings.

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Sheet 1

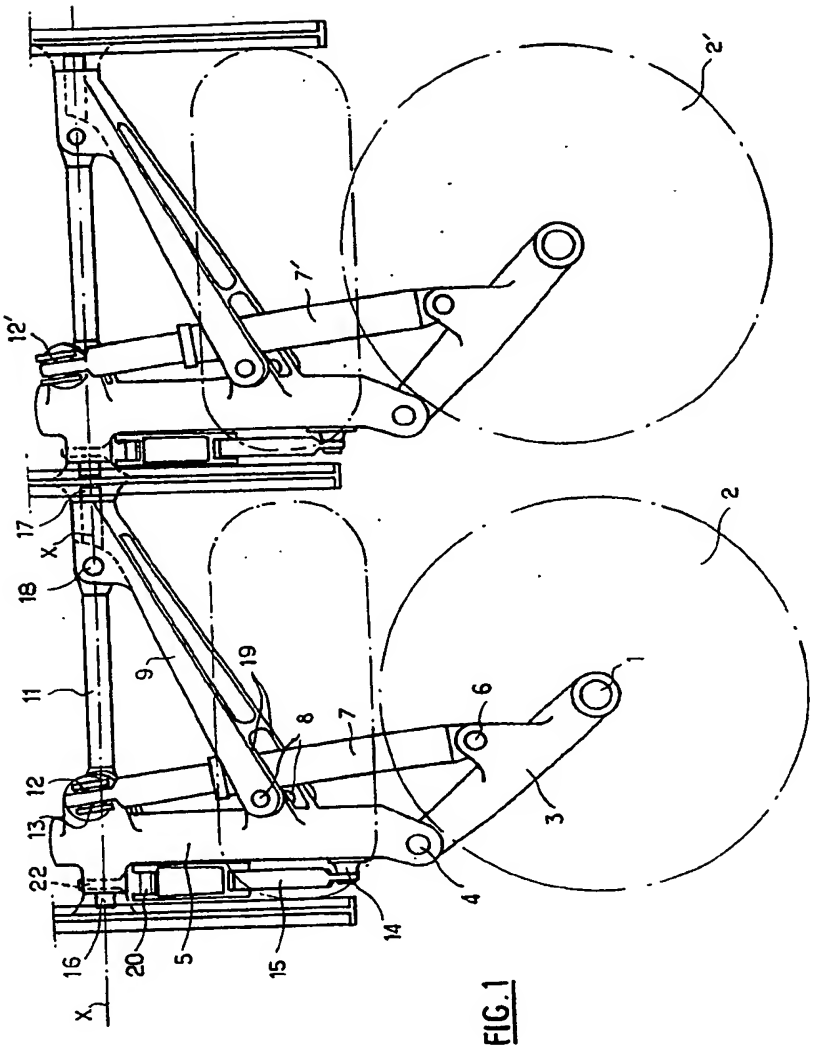

FIG.1

1423895 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

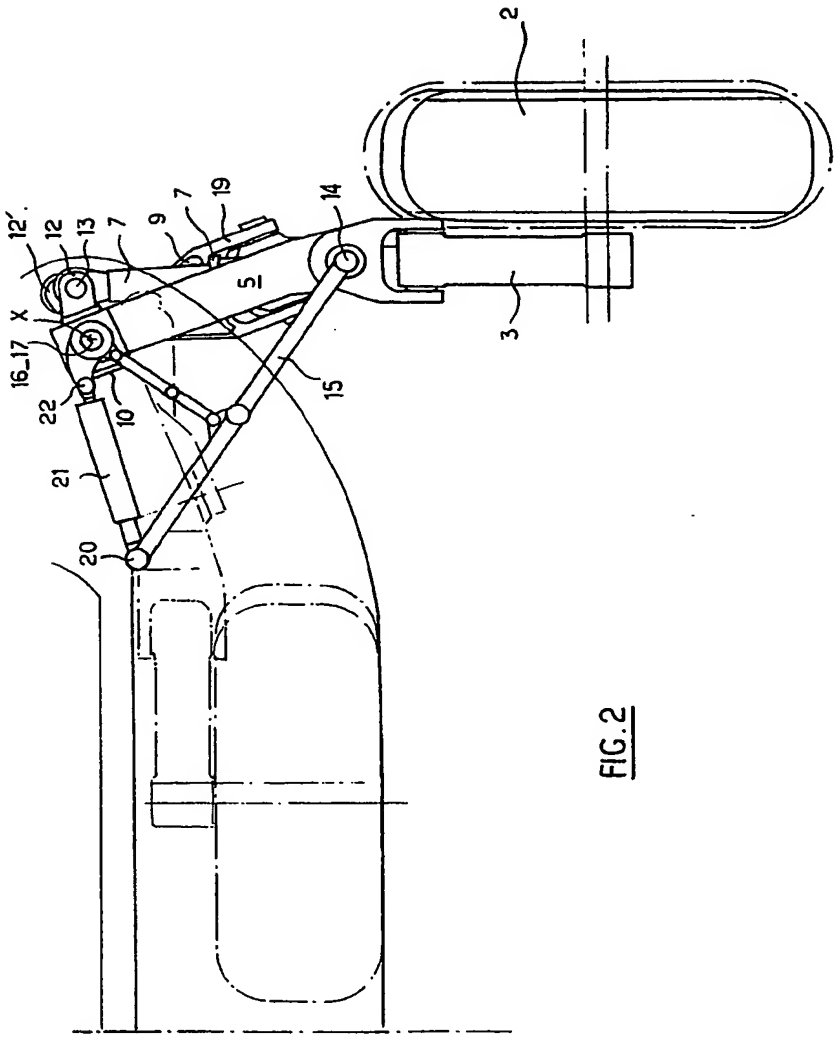

FIG.2

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